

birds are said to have been sold some years ago in the course of an afternoon, and the number of West Indian and Brazilian birds sold by one auction-room in London during the four months ending April 1885, was 404,464, besides 356,389 Indian birds, without counting thousands of Impeyan pheasants, birds of paradise, &c. In Mr. Dutcher's article on the "Destruction of Birds for Millinery Purposes," he quotes from an article in *Forest and Stream*, wherein one dealer, during a three months' trip to South Carolina, prepared no less than 11,000 skins. "A considerable number of the birds were, of course, too much mutilated for preparation, so that the total number of the slain would be much greater than the number given. The person referred to states that he handles, on an average, 30,000 skins per annum, of which the greater part are cut up for millinery purposes." During four months 70,000 birds were supplied to New York dealers from a single village on Long Island, and an enterprising woman from New York contracted with a Paris millinery firm to deliver during this summer 40,000 or more skins of birds at 40 cents apiece. From Cape Cod, one of the haunts of the terns and gulls, 40,000 of the former birds were killed in a single season, so that "at points where, a few years since, these beautiful birds filled the air with their graceful forms and snowy plumage, only a few pairs now remain." The above extracts out of many interesting facts which could be quoted from the articles in *Science*, give some idea of the slaughter which is going on at the present time, and it is to be hoped that some immediate steps may be taken to call public attention to this wholesale bird-murder, before the nesting season begins, when most of the mischief is done among the sea-birds, which congregate in large numbers at that time of year.

Space does not permit us to traverse the whole of the ground taken up by our contemporary, whose articles occupy fifteen pages, but we trust that they will be perused by our readers for themselves. Mr. Sennett's essay on the "Destruction of the Eggs of Birds for Food" proves the wanton waste which accompanies the ways of the professional "egger," to say nothing of the cruelty which accompanies the taking of the eggs. The "Relation of Birds to Agriculture" is a well-written article, as is also an essay on "Bird-Laws," the latter containing resolutions which, if adopted by the Legislature, would undoubtedly prove of great service in protecting bird-life on both sides of the water, but no legislation will avail unless the women of America and Europe can be made to understand that they are absolutely responsible for the wholesale destruction of birds which is now going on, to the great benefit of the plume trade and the milliners, but to the everlasting detriment of the world on which we live. We should like to see some authorised body, such as the British Ornithologists' Union, the Selborne Society, or a Committee of the British Association, taking this matter in hand and organising public meetings to bring the true facts of bird-slaughter before the public; and we have every faith in the good sense of English women to secure a stoppage of the trade which exists by their patronage alone, and which is thoroughly antagonistic to the instincts of humanity.

R. BOWDLER SHARPE

MR. GEIKIE'S "CLASS-BOOK OF GEOLOGY"

Class-Book of Geology. By Archibald Geikie, LL.D., F.R.S. (London: Macmillan and Co., 1886.)

"GEOLOGY is essentially a science of observation. The facts with which it deals should, as far as possible, be verified by our own personal examination. We should lose no opportunity of seeing with our own eyes the actual progress of the changes which it investigates, and the proofs which it adduces of similar changes in the far past. To do this will lead us to fields and hills, to the banks of rivers and lakes, and to the shores of the sea. We can hardly take any country walk, indeed, in which with duly observant eye we may not detect either some geological operation in actual progress, or the evidence of one which has now been completed. Having learnt what to look for and how to interpret it when seen, we are as it were gifted with a new sense. Every landscape comes to possess a fresh interest and charm, for we carry about with us everywhere an added power of enjoyment, whether the scenery has been long familiar or presents itself for the first time. I would therefore seek at the outset to impress upon those who propose to read the following pages, that one of the main objects with which this book is written is to foster a habit of observation, and to serve as a guide to what they are themselves to look for, rather than merely to relate what has been seen and determined by others."

In these words, which form the concluding paragraph of the introduction to Mr. Geikie's "Class-Book on Geology," we have the key-note to the whole work, and the promise which they contain is amply redeemed in the pages which follow. Our author has wandered over many lands; he has always carried with him eyes to see, and the habit of using them which he strives so earnestly and so successfully, in this his latest book as in those which have preceded it, to develop in his readers; and out of the stores of his ripe and varied experience he brings, to throw light on his subject, a wealth of illustration which excites the envy, while it commands the admiration, of those who have not enjoyed all the opportunities for varied observation which have fallen to his lot. But even if passing feelings of envy will obtrude themselves as one happy illustration after another, new from this quarter and new from that, finds a fitting place in the narrative, they soon give way to the pleasanter feeling of satisfaction that these opportunities have been placed within the reach of one who knows so well how to use them; not for the advancement of his own knowledge merely, but whose chief pleasure is to distribute with open hand his treasures to all who care to share them, who has the seeing eye to note, the ready pencil to depict, and the facile pen to paint in words all those manifold workings of nature by the study of which geology was snatched from the shadowy realms of guess-work, and based on a firm scientific foundation.

At the very outset geology is looked at in its proper light, not as an amusement for the collector and a means of learning where he will get pretty and curious objects for his cabinet, not as a field where the ingenuity or perversity of the classifying mind may delight itself with grouping natural products as reason or fancy prompts, not in any other of these limited aspects,

beyond which it is to be feared the vision of some geologists never reaches ; but as a history, the history of the earth during ages long gone by. And as the historian is careful to inform his readers of the sources from which he has drawn his information, what manuscripts he has collated, what monuments he has inspected, what inscriptions he has deciphered, so the book opens with a description of the materials which are available for constructing a history of the earth. First of all we are reminded that "that history is in progress now as really as it has ever been, and that its events are being recorded in the same way and by the same agents as in the far past;" so that "if we would explore its records in the dark backward and abyss of time, we must first make ourselves familiar with the manner in which these records are being written from day to day before our eyes." We are introduced to this study by an account of the manner in which atmospheric agents are bringing about ceaseless decay over the whole of the surface of the globe. The important part played by the freezing of water receives due notice, but it would seem that sufficient stress is not laid on the magnitude of the force generated during this process. That ice "pushes aside the particles between which it is entangled" would hardly prepare one who does not know it for the fact that ice can burst asunder a cast-iron shell. The figure on p. 72, it may be noticed in passing, does not strike us as very happy. We must also take exception to the reasoning on p. 105 : so very little is known about the formation of the manganese nodules and coatings of the abysmal depths of the ocean, that it is somewhat risky to assume that it was an exceedingly slow process. Perhaps, too, a little over-confidence is shown in treating of "fissure eruptions"; doubtless some otherwise puzzling facts do receive easy explanation on the hypothesis that such eruptions have taken place, but this is not enough to convert the hypothesis into a certainty.

We next pass to a description of the more important elements, minerals, rocks, and rock-structures of the earth's crust. It is extremely difficult to decide how much or how little chemistry and mineralogy is desirable in an elementary treatise on geology. It is not safe to refer to special works on these subjects, because the majority of readers would not take the trouble to make the reference, and yet the descriptions which the limits of space will allow of are necessarily so curt and meagre as to be of little practical use ; if therefore we criticise any portions of Chapters X. and XI. it is not because we are not fully alive to the difficulties of dealing in an elementary fashion with the subjects of which they treat. In the definition of a mineral it should certainly have been stated that minerals, besides having definite chemical composition and definite geometrical form, have also definite physical properties, such as hardness, which are most valuable as means of recognition.

Again, in the description of a crystal, one of the first points to impress on a beginner is that the dimensions of the faces and edges are of no importance, and that the one thing to note is the constancy of the interfacial angles, and this is a simple truth which any one may be got to understand ; we wish this had been brought out more clearly. The author has followed the time-honoured

custom of giving a brief summary of the six crystallographic systems. We are sadly afraid that the descriptions, though perfectly accurate as far as they go, and the excellent figures by which they are illustrated, take up room which might be more usefully employed, for these few paragraphs will never enable a student to read a crystal unless it be of the simplest character, and they are not full enough to be an introduction to a more detailed study of crystallography. It has always seemed to us that the best plan for an elementary work would be to take one actual crystal—say of orthoclase, with basal and prismatic faces, clinopinacoids, and orthodomes—and, without using any of these technical terms, to explain how the crystallographer arrives at this crystal by grafting, so to speak, certain additional faces on an ideal simple prism ; how the shape of that prism can be defined by reference to certain lines and their inclination to one another, which are called axes ; how the position of the additional faces are related to these axes—all of which are geometrical truths of the simplest character ; and then to say how all crystals, however complicated, can in like manner be referred to certain simple forms of which there are six ; and if you want to know how, you must go to a work on crystallography.

The student will then get a real knowledge of one actual crystal, instead of learning by rote descriptions of ideal forms, not one of which he will meet with in nature. We may next note one or two statements which might be usefully amended in a second edition. It is not universally the case that the least fusible mineral crystallises first in a molten rock, as stated on p. 169 ; it would be well to mention that the rhombohedral crystals of hæmatite (p. 172) are usually so very flat that they look like plates or laminae ; some zeolites (p. 176) contain calcium and barium as well as alkalies ; whether alumina replaces the bases or the silica in hornblende (p. 177) is a question on which chemists do not seem to be agreed ; under the head of calcite (p. 179) the wording would imply that the difference between nailhead and dogtooth spar consists only in a difference in the length of the chief axis, which is not the case. When it is said that gypsum is not "affected by acids" (p. 206), it is probably meant that it does not effervesce with acids. The evidence for looking upon heat as a pseudomorph after chalk, so to speak, is so strong that it might have been alluded to on p. 212. Under the head of quartzite it would have been desirable to notice that the conversion of sandstone into quartzite has in many cases been mainly brought about by the deposition of silica between the original quartz grains. And while we are on the subject of metamorphism it will be well to call attention to a slight inaccuracy of language into which our author, in common with many other geologists, has fallen. The important part played by pressure in developing schistose structure in rocks is now very generally recognised, and has been nowhere better illustrated than by the labours of Mr. Geikie and his colleagues on the Geological Survey among the crystalline schists of the Highlands, and a fashion has arisen of speaking of the action as "shearing." Now, that shearing has taken place there can be no doubt, but shearing is not all that has happened : the particles have not only been slid over one another, but they have been rolled out and flattened

in the process. Shearing does not necessarily involve flattening, though in a large number of cases the two would doubtless go together. For this reason it is not correct to speak of cleavage as due to "shearing" (p. 255): shearing alone will not produce all the phenomena of cleavage; there must be flattening of the particles as well. Under the head of "Joints," instead of vaguely stating that some joints may be due to compression or torsion, would it not have been better to introduce a few lines about Daubrée's experiments, which almost bring a conviction that the majority of joints in sub-aqueous rocks are due to torsional strain?

In Part III., to which some of the above criticisms apply, we have a clear account of the way in which the crust of the earth is built up out of the materials described in Part II. Then follows Part IV., "The Geological Record of the History of the Earth." This must necessarily be presented in an abridged form, and if any fault is to be found with the way in which the subject is handled, it might perhaps be said that an attempt has been made to be rather too encyclopædic. Graphic pictures, such as the author can so well pen, of the physical geography of our own country, and, where necessary, of the adjoining parts of Europe, during the different geological periods, would perhaps have been more acceptable and instructive to most of those who will read this book than palæontological details and accounts of the range of formations through other lands. For instance, the sketch of the physical geography of Europe during the Triassic period on p. 380, strikes us as singularly happy, and we should like to have seen more of the same kind of thing in the book. We all know how the pigeon-hole geologist deals with this question; how he produces his parallel ruler and divides his sheet of paper nearly into squares; how he puts the names of countries into the squares on the top line and the names of formations into the squares down one side, and then proceeds to fill in his puzzle. Under the column "England," line "Muschelkalk," he inserts "Wanting." Ha! says he, a whole formation missing! great unrepresented interval! there must be a corresponding unconformity. Primed with this idea he now takes to the field, finds that the evenly-bedded New Red Marl does lie irregularly on the false-bedded sand-banks of the New Red Sandstone, and is overjoyed to see the unconformity which his chess-board told him must be there. Had he used, in trying to realise the meaning of the geological facts, half the ingenuity he showed in distorting them in order to fit them on to his Procrustean bed, he would have seen that what is called the Muschelkalk is not the only marine intercalation in the Trias of Central Europe, but that minor muschelkalks occur both in the Keuper and Bunter; that each of these marks an advance of the Triassic sea over the district where they are found; and that the reason why neither the great nor the little muschelkalks are found in England is that the sea did not succeed in pushing its way as far west as our country during any of its incursions. But there is no pigeon-holing in the book before us, and where the author has tried to bring before us a picture of the physical geography of bygone time, he has been so successful that we wish he had given us more of them.

A. H. G.

OSCAR SCHMIDT'S "MAMMALIA"

The Mammalia in their Relation to Primæval Times.

By Oscar Schmidt. International Scientific Series. (London: Kegan Paul, Trench, and Co., 1885).

THE numerous and important discoveries that have been made in the last few years in extinct forms of mammalian life, and the light that has been thus thrown upon the relations of the surviving species, render a popular summary of our present knowledge of the class a very desirable undertaking. Moreover any work which, by showing the intimate relation of the present with the past, aids in breaking down the custom, which has descended to us from an antiquated condition of scientific culture, of treating separately of the existing and the extinct forms of life, of speaking of zoology and palæontology as if they were distinct subjects, must be welcomed by the philosophical naturalist.

In undertaking such a work the late Prof. Oscar Schmidt, of Strasburg (whose death we regret to say has been recently announced), acknowledges that he was departing from the specialty in which he had so highly distinguished himself, and was deriving his materials entirely from the researches of others. But the subject evidently had strong attractions for him, and he has most industriously and impartially compiled from the best authorities a work which, if it had been written in any one of the languages of the series of which it forms a part would have well served the purpose intended. The attempt, however, to give it a truly "international" character, by bringing it out in a combination of two languages, is unfortunately anything but successful. Words are continually occurring, which, though perhaps literal translations of German pseudo-vernacular expressions of modern manufacture, can convey no meaning to the English reader, whatever assistance he may get from the dictionary, as for instance, "spoon-dog" (for the African large-eared fox, *Otocyonalandii*), "fingered-animal" (for Chiromys), "forked-animals" (for the Monotremata), "dog-fish" (for seal); and such expressions as "mid-jawbone," "root of the hand," "middle hand," "skiff-bone," and "spoke" are far less intelligible to the student of ordinary education than their generally-accepted scientific equivalents "premaxilla," "carpus," "metacarpus," "navicular," and "radius." Misprints and inaccuracies abound everywhere, such as the habitat of the small species of hippopotamus being transferred from Liberia to Siberia, the reference to "African armadillos" and to Prof. Huxley's discovery of fibrous epipubic structures "in several hundred different species of dogs"! As a specimen of style we may quote the following sentence:—"When it is said that the Marsupials 'vicariate' in Australia for the other groups distributed on the other continents, this expression denotes nothing but the bare fact, nothing but the mere statement, that in America we do not meet with the camel but with the llama, which in a few main characteristics shows some affinity with it" (p. 13). With the general argument against the idea that the expression "vicarious," or, as English authors generally say, "representative," species offers no explanation of the facts of distribution we entirely agree, and we can even see what was floating through the author's mind when this extraordinary sen-